

Serial No. 09/491,353

Attorney Dkt No. 06618-505001/CIT-3061

Amendment to the Claims:

This listing of claims replaces all prior versions, and listings, of claims in the application:

1. (Currently amended) A computer-implemented method for modeling a shell comprising:

modeling an initial undeformed geometry of the a shell; as a mesh;

characterizing an environment for the shell, including determining environmental factors affecting the mechanical behavior of the modeled shell, the environmental factors including loading conditions, material properties, and boundary conditions for the modeled shell, and the loading conditions including an indication of applied forces;

computing by a computer a mechanical response of the modeled shell modeled as a set of linear differential equations representing at least both of: 1) a strain energy density per unit area, and 2) an external forcing vector, at least one of said linear differential equations having a fourth order differential operator, taking into account said environmental factors, using a finite element analysis to compute a deformed geometry of the modeled shell-surface, including generating smooth interpolated displacement fields possessing bounded energy according to a nonlocal subdivision-surfaces-based interpolation scheme, without using nodal rotations, such that

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resulting displacement fields defined over overlapping patches
combine conformingly to define a limit surface wherein the
finite element analysis uses smooth subdivision basis functions
as shape functions, said computing forming the subdivision basis
functions by subdividing the mesh, and recomputing vertex
positions of the mesh as a weighted average of neighboring
vertex positions; and

outputting a description of the deformed geometry of the
modeled shell as determined from the computed mechanical
response.

2 - 3. (Cancelled)

4. (Currently amended) The method of claim [[2]] 1, wherein
the loading conditions further include[[s]] an indication of
thermal loading.

5. (Original) The method of claim 1, further including
outputting indications of the characterized environment.

6 - 8. (Cancelled)

9. (Currently amended) A system of modeling a shell
comprising:

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(a) means for forming modeling an initial undeformed geometry of the a shell as a mesh;

(b) means for characterizing an environment for the shell, including determining environmental factors affecting the mechanical behavior of the modeled shell, the environmental factors including loading conditions, material properties, and boundary conditions for the modeled shell, and the loading conditions including an indication of applied forces;

(c) means for computing by a computer the a mechanical response of the modeled shell as a set of linear differential equations representing at least both of 1) a strain energy density per unit area; and 2) an external forcing vector, at least one of said differential equations having a fourth order differential operator, taking into account said environmental factors, using a finite element analysis, including means for generating smooth interpolated displacement fields possessing bounded energy according to a nonlocal subdivision-surfaces-based interpolation scheme, without using nodal rotations, such that resulting displacement fields defined over overlapping patches combine conformingly to define a limit surface with smooth subdivision basis functions as shape functions, where computing means determines the subdivision basis functions by recomputing vertex positions of the mesh as a weighted average of several neighboring vertex positions; and

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(d) means for outputting a description of the deformed geometry of the modeled shell as determined from the computed mechanical response.

10 - 11. (Cancelled)

12. (Currently amended) The system of claim [[10]] 9, wherein the loading conditions further include[[s]] an indication of thermal loading.

13. (Original) The system of claim 9, further including means for outputting indications of the characterized environment.

14 - 16. (Cancelled)

17. (Currently amended) A computer program, residing on a computer-readable medium, ~~for performing finite element analysis on a shell~~, the computer program comprising instructions for causing a computer to perform operations comprising:

(a) modeling an initial ~~undeformed~~ geometry of the ~~a~~ shell;

(b) characterizing[[e]] an environment for the shell, including environmental factors affecting the mechanical

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behavior of the modeled shell, the environmental factors including loading conditions, material properties, and boundary conditions for the modeled shell, and the loading conditions including an indication of applied forces;

(c) computing[[e]] by a computer the a mechanical response of the modeled shell, as a set of linear differential equations, representing at least both of 1) a strain energy density per unit area, and 2) an external forcing vector, at least one of said linear differential equations having a fourth order differential operator, said compute taking into account the characterized environmental factors, and using a finite element analysis to compute a deformed geometry of the modeled shell, including generating smooth interpolated displacement fields possessing bounded energy according to a nonlocal subdivision-surfaces-based interpolation scheme, without using nodal rotations, such that resulting displacement fields defined over overlapping patches combine conformingly to define a limit surface wherein the finite element analysis uses smooth subdivision basis functions as shape functions, where the compute determines the subdivision basis functions by subdividing the shell into a mesh, and recomputing vertex positions of the mesh as a weighted average of several neighboring vertex positions, and

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(d) outputting a description of the deformed geometry of the modeled shell as determined from the computed mechanical response.

18 - 19. (Cancelled)

20. (Currently amended) The computer program of claim [[18]] 17, wherein the loading conditions further include[[s]] an indication of thermal loading.

21. (Currently amended) The computer program of claim 17, the operations further including ~~instructions for causing the computer to~~ outputting indications of the characterized environment.

22 - 32. (Cancelled)